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DISTINGUISHING BETWEEN SCIENCE AND SCIENTISM

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Abstract

Issues of conflict between science and faith/religion have existed for a long time. Some of the topics that have become the source of the conflicts are: The Evolution Theory and The Big Bang Theory which are assumed to be in contra with the creation story, which is generally believed by people of faith. The other controversial issue concerns the existence of God as a supernatural being. Even though in Indonesia these issues are more often viewed to be taboo, the hot debate between the atheist scientists and religious people in academic spheres occurs openly in some countries. However, do we have to choose between believing in science or believing in God? Which is the reliable source of truth? This writing discusses the epistemology of science and its strength as well as its limitation as a body of knowledge. The author is trying to describe scientism as an invalid worldview that leads to misunderstandings and conflict's myths between faith and science.

Keywords: Faith and science, scientism, reproducibility and clarity.

Abstrak

Isu-isu pertentangan antara sains dan keimanan atau agama sudah bukan merupakan hal baru. Beberapa topik yang menjadi sumber konflik: Teori Evolusi dan Teori Ledakan Besar yang dianggap bertentangan dengan kisah penciptaan, yang diyakini sebagai kebenaran oleh kelompok beragama pada umumnya. Topik lainnya adalah perdebatan tentang bukti keberadaan Tuhan Allah sebagai pribadi supernatural. Walaupun di Indonesia hal ini sering masih dianggap tabu, perdebatan yang sengit antara kelompok ilmuwan ateis dan agamawan di kalangan akademisi terjadi secara terbuka di beberapa negara tertentu. Apakah kita harus memilih salah satu saja antara: sains atau iman kepada Tuhan? Manakah yang lebih dapat diandalkan sebagai sumber kebenaran? Tulisan ini membahas epistemologi dan kekuatan sains sekaligus keterbatasannya sebagai disiplin ilmu. Penulis juga mencoba memaparkan kekeliruan paham saintisme, yang menyebabkan kesalahpahaman dan mitos pertentangan antara iman dengan sains. .

Kata Kunci: iman dan sains, dapat direproduksi, kejelasan.

1. Introduction

In the vocabulary of the Indonesian language, we are not accustomed to using the word 'S*cientism'*. Yet I see some cultural consequences of scientism especially within educated communities in Indonesia's large cities. What is Scientism actually? In short, Scientism is the belief that scientific knowledge is the only form of true knowledge.[4] It holds that reality only consists of those things that can be identified by science and supported by evidence drawn from systematic observation and experiments. Scientism assumes that rational knowledge is scientific, and that everything else that claims to be knowledge is just superstitious, irrational, emotional, or nonsensical[1]. Although Science and Scientism do share the same topics and content, their worldviews are entirely different. There is no warfare between science and religion, but scientism clashes with religion as well as with other disciplines.

2. Scientism

Scientism is a philosophy of knowledge; an opinion about the way knowledge can be obtained and justified, human experience is interpreted, and how reason is guided. Scientism is the belief that all valid knowledge is found in natural science. However, the influence of this viewpoint are so great that if these tenets are accepted scientism becomes much more than that. It rapidly becomes an all-encompassing worldview; a perspective from which all of the questions of life are examined; a grounding presupposition which provides the framework by which the world is to be understood. Therefore, from scientism spring many other influences on worldviews, most notably the principles that guide our understanding of meaning and truth, the ethical and social understanding of who we are and how we should live, and ultimately our answers to the important questions about our religious beliefs[1].

In his famous book "*The God Delusion*," the militant atheist Richard Dawkins suggests that the existence of God is a scientific hypothesis. "God's existence or non-existence is a scientific fact about the universe, discoverable in principle if not in practice" (p.72). He wrote a lot and tried to show that, if regarded as a scientific question, the existence of God has poor supporting evidence[2]. But the problem is not how strong the evidence is, but whether the existence of God is a scientific question. But Dawkins does not even bother to acknowledge the possibility of such a distinction between science and non-science.

3. The Scientific Enterprise

To be clear, we will try to explore the definition of science. Semantically, the Latin derivation of science (*scientia*) simply means "knowledge". The Encyclopdie (edited by Dennis Diderot, published during 1751-1777) defines science as a philosophical concept, whether founded on self-evident principles, or via systematic demonstration[1]. If science just meant systematic knowledge, then theology and economics would still be a science. A Long time ago, science wasn't always understood to mean "natural science" as it is

today, but simply meant all systematic bodies of knowledge. A historian named Thomas Macaulay (1800-1859) defined science very broadly as "*the intellectual component of the growth of the human mind.*"[1]. But his examples were: agriculture, medicine, chemistry, botany, magnetism, comets, etc. In other words, he was talking about natural science. Some historical usages still linger (e.g political science, social science). There has been a certain ambiguity for many centuries regarding the usage of the word "science". On the one hand, science has been defined as any body of systematic or orderly thinking, but on the other hand there has been a tendency to regard science solely as natural science, which deals with physics, biology, physiology, cosmology and so on[3]. In *Bahasa Indonesia* we usually use the term '*ilmu*' for science as knowledge in general, as is found in '*ilmu politik'*, '*ilmu sosial'* etc. But we have now absorbed the word 'sains' to emphasize natural science which is distinguished from the other 'ilmu'. But even if we use the modern meaning of science as the study of nature, it is still not a coherent way to define science. The word 'nature' is not a clear concept and is ill-defined, so rather than defining science through its **topics**, it would be better to identify science through its **methods**[3].

We shall address what science is, not based on the subjects that it studies, but from the characteristics and strategies that it develops. The distinctive methods by which scientists have been developing new knowledge are observation, experiment, measurement, systematization, mathematical modeling, self-consistency, etc. Generally we can simply say that science is a body of knowledge which is developed through a scientific cycle described in the diagram below.

We try to make sense of the facts that we observe around us by making theories. A good theory must enable us to form new hypotheses. If we cannot, then scientific inquiry comes to a halt, because the way science progresses is through forming new hypotheses. Unless the theory is fruitful, it is sterile and useless[4]. The hypothesis is then tested through a controlled experiment. Successful confirmation of the hypothesis does not necessarily prove the theory to be a hundred percent true. It just makes the theory stronger and more convincing in its explanatory power and its dependability in making predictions. Likewise, if a hypothesis is not confirmed by experiment, it doesn't necessarily mean the theory has been disproved. There are some possible reasons for the unconfirmed hypothesis: a flawed experiment (error, malfunction, and unknown/unanticipated effect), misinterpretation of data by the researcher, misunderstood theory by the researcher that led him to make a false hypothesis, or a hypothesis that may have addressed an area which the incomplete theory doesn't encompass yet[4].

It is incorrect to look down upon theories as inferior to facts. In science, everything is theoretically based. It is also incorrect to regard a theory as having the same status as scientific facts. For example, the proposition that says "All matter is made of atoms" is a theory, not a scientific fact because we don't yet understand about dark matter (which is still hypothetical, and is believed to make up 22% of the mass of the universe, and has mass but no electrical charge) and it cannot fit into our atomic theory of matter[4].

Here is an example of how the scientific cycle drawn above works in the development of humans' understanding about heavenly bodies. Begin with the observable facts about the time when the sun rises & sets every day, the moon's shape every night, retrograde

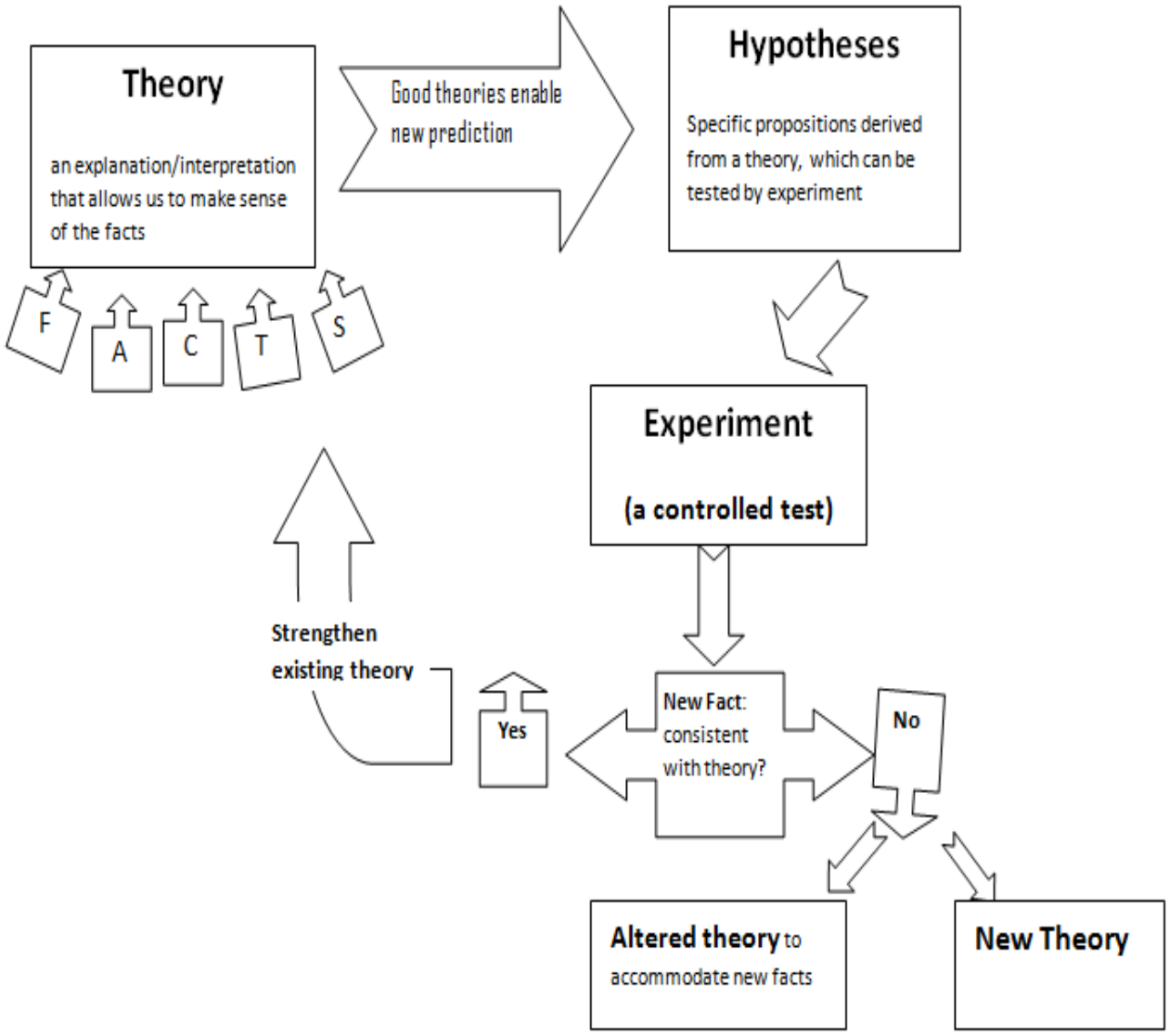

Figure 1. Diagram of The Scientific Cycle[4].

motion of certain planets, the pattern of the stars' appearances, etc. And thus, Ptolemy espoused the geocentric model of all known heavenly bodies. It can explain why planets appeared in different parts of the sky at different times. The mathematical models were sophisticated and could be used to make predictions about planetary movements such as dates of eclipses. Yet predictions made using the Ptolemaic model always contain some error (by a few days/weeks), while Copernicus' new model (1543) did as well as the Ptolemaic theory and while still had some error but is comparably accurate. What was interesting though is that the math models were significantly simpler because of the assumption that the sun is in the middle of the solar system. In 1563, Tycho Brahe used the Copernican model to predict the Saturn and Jupiter conjunction, and found that the prediction was still off by a few days. So it was not a completely correct model yet. In 1609, Johannes Kepler resolved this problem by discovering that the planetary

orbits were elliptical. This improvement has been triumphant and stands to this day as our theoretical understanding of how the solar system works. If we could summarize the complexity of that scientific enterprise cycle into two crucial characteristics, then those are reproducibility and clarity[4].

3.1. Reproducibility

Michael Faraday is an interesting person in the history of science. It was said of him that whenever he heard about a new discovery reported in a scientific meeting or journal, he would rush down to his laboratory at the Royal Institution in London and try to reproduce it. Michael Faraday said that he had the most active imagination; he could imagine anything out of a radiant light, but imagination must be anchored by facts. He said that "Facts were important to me and saved me. Without experiment, I am nothing." So Faraday emphasized the vital role that reproducible experiments have in scientific development[1].

One question may arise about observational sciences like astronomy. How could we reproduce an observation of those heavenly bodies such as an expanding star? Of course it was a single event, but It was not a unique event; there are many other similar stars that have expanded in the same way. Even more, when we recorded the expansion and tracked back to estimate a certain date, we found that it was accurate. It was accurate because the repeatability gave astronomers the ability to predict with amazing precision the phenomena of the heavens. Observational science requires *multiple repeatable examples* of the phenomenon or specimen under consideration. It does not require that these can be produced *at will* in the way that a laboratory experiment can in principle be performed at any hour on any day[3]. Observations may be constrained by the fact that the examples of interest occur only at certain times (e.g., eclipses) or in certain places (e.g., in specific habitats), over which we might have little or no control. But it does require that multiple examples exist and can be observed.

There are many disciplines which are not reproducible. History, for example doesn't possess the character of reproducibility. How could we know the truth about Soekarno and Hatta that they read the independence text in Jakarta on August 17^{th}, 1945? Obviously, it is concerned with unique events in the past that cannot be repeated. We recognize it as a (*historical*) fact even though we cannot prove it scientifically. History is real and essential knowledge, but is simply not scientific in the sense that we mean today. Similarly, the study of the law is a field whose research and practice cannot be scientific because it is not concerned with the reproducible. The circumstances of particular events cannot be subjected to repeated tests or to multiple observations. Those examples are to illustrate that science is not the only knowledge there is; it may not even be the most important knowledge. And however much we might hope for greater precision and confidence in the findings of the non-scientific disciplines, it is foolish to think they will ever possess the kind of predictive power that we attribute to science. Those fields of study do not lend themselves to the epistemological techniques that underlie the reliable models and convincing proofs of science. They are about more indefinite, intractable, unique, and often more human problems[1],[3].

3.2. Clarity

Clarity is a foundational requirement of the expression and communication of reproducibility. The result of any scientific experiment has to be expressed in terms that are unambiguous, otherwise it is impossible to judge whether the repeated experiment confirms the prior result. In measurement, we reduce the description of nature into numbers. In physics, mathematical expression is ideal, but in other fields like biology, many physiological processes and living organisms' characteristics are not described in mathematic language, yet they still demand high clarity.

3.3. The scope of Science

Many other matters are not scientific (in the sense of natural science) because they are lacking those two qualities of reproducibility and clarity. But nevertheless they are important and true. For example: the beauty of a sunset, justice, compassion, a symphony, terror, and amorous love. Scientifically, we can describe a musical symphony in terms of numbers and digital waves, but do those presentations describe the significance of the beauty of the music? Is the sound of music simply nothing more than the vibration of air molecules? The meaning of music is not captured in electronic representation but by the act of hearing. Music is an example of a field that lacks clarity, but it doesn't mean that music itself is not real knowledge[3].

This requirement of reproducibility and clarity also means that **science is limited**. Some types of knowledge are deliberately excluded by science. A good example of what is not included in science is the description of purpose. Jacques Monod wrote in his "*Chance and Necessity*" that the cornerstone of the scientific method is the postulate that nature is objective, or in other words, the systematic denial that "true" knowledge can be achieved by interpreting phenomena in terms of final causes, that is to say, of "purpose"[3]. This quote describes an example of opposition to implicit scientism. It does describe the characteristic of natural science that it rules out purpose. There can never be a scientific description of purpose.

I hope the long discussion of what science really is, and how scientific enterprise works will enable us to distinguish between what is science and what is NOT science in the modern context. At least the two characteristics mentioned above will be sufficiently accepted as necessary criteria and an important part of the definition of science. Demarcation between science and non-science becomes a complicated task in the context of scientism. Because scientism thinks that the only valid reason and evidence are those which can be obtained by scientific methods, distinguishing science and non-science is like separating sense and nonsense. For example, in several countries, the debate continues about whether the theory of evolution needs to be taught in high schools. This dispute would not be a problem if we get rid of this worldview of scientism[3].

4. Scientism in history and its influence today

The objection to scientism doesn't come only from science but also from economics, one of the most distinguished social discipline. F.A Hayek, a Nobel Prize winning economist wrote:

"*During the first half of the nineteenth century, a new attitude made its appearance. The term science came more and more to be confined to the physical and biological disciplines which at the same time began to claim for themselves a special rigorousness and certainty which distinguished them from all others. Their success was such that they soon came to exercise an extraordinary fascination on those working in other fields, who rapidly began to imitate their teaching and vocabulary. Thus the tyranny commenced which the methods and technique of the Sciences in the narrow sense of the term have ever since exercised over the other subjects. These became increasingly concerned to vindicate their equal status by showing that their methods were the same as those of their brilliantly successful sisters rather than by adapting their methods more and more to their own particular problems. And, although in the hundred and twenty years or so, during which this ambition to imitate Science in its methods rather than its spirit has now dominated social studies, it has contributed scarcely anything to our understanding of social phenomena. Not only does it continue to confuse and discredit the work of the social disciplines, but demands for further attempts in this direction are still presented to us as the latest revolutionary innovations which, if adopted, will secure rapid undreamed of progress.*" [1].

Post-modernism's[1] rejection of science is actually a rejection of scientism. Jean Francois Lyotard (1979) said: "*Scientific knowledge does not represent the totality of knowledge; it has always existed in addition to, and in competition and conflict with, another kind of knowledge, which I will call narrative. Knowledge is not the same as science*"[3]. Unfortunately, many people take this philosophy to the extreme in rejecting scientific expertise. The danger in postmodernism is that it burns the whole barn to kill a single mouse inside. And it is not necessary as long as we draw a clear boundary between science and scientism.

One might ask, when was scientism actually established? It is often thought that the old "war" between science and religion (as an area that is most attacked by atheism, which is the descendant of scientism) began back in the time of Galileo.

The picture presented here portrays science as a scientific saint who wins a battle over religion. Galileo in the painting is drawn in a very heroic pose, with a halo around his head and an illuminated face. The inquisitor is painted as antagonist and is demanding at Galileo to repent. This picture describes an event that happened in the 17^{th} century, but was itself created with a 19^{th} century view. This painting of Galileo's trial captures the spirit of the scientism during that time. Scientism was a strategy used in the battle to overthrow religious authority in universities during the 19^{th} century[3].

[1]Postmodernism essentially stems from a recognition that reality is not simply mirrored in human understanding of it, but rather, is constructed as the mind tries to understand its own particular and personal reality. Postmodernism is skeptical of explanations which claim to be valid for all groups, cultures, traditions, or races, and instead focuses on the relative truths of each person.

Figure 2. "Galileo_what really happened" [5].

From history, we can see that the worldview of scientism has affected several other worldviews such as: positivism (true knowledge must become scientific), social Darwinism (an attempt to derive purpose and meaning scientifically), sociobiology and evolutionary psychology (derive values and morality scientifically) and lastly: 'new' atheism. I will briefly discuss new atheism here to show that it really comes from the worldview of scientism[3].

The three main ideas of new atheism are: first, God is a scientific hypothesis which science has now shown to be poorly validated. Second, religion is viewed as a pure natural phenomenon or product of human psychology. Dawkins suggests that 'personal' experience of communicating with God is analogue to some mental illness. *"Constructing model is something that human brain is very good at. When we are asleep it is called dreaming; when we are awake we call it imagination or, when it is exceptionally vivid, hallucination." [2].* Third, religion is evil.

The first and the second are based on scientism. The distinction between scientific questions about nature and metaphysical questions about God is very obvious[3]. Not every question can be answered scientifically. Sure, there are historical questions, and philosophical questions whose answers are not going to be a kind of scientific evidence. Sir Jonathan Sacks said," *We can't prove that life is meaningful and that God exists, but neither can we prove that love is better than hatred, forgiveness than revenge. Almost none of the truths by which we live are provable.*[6]

5. Conclusion

Science has limitations of scope, inherent within its characteristics and methods, which don't apply to many important aspects of life. Science alone cannot prove the theistic perspective, neither can it disprove it. Scientism, on the other hand, is an inevitable rival

to theism as well as to other non-scientific disciplines, because scientism has monopolized knowledge by assuming that real and valid knowledge can only be found in science.

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References

[1] Hutchinson, I. 2011. *Monopolizing Knowledge*, available at http://monopolizingknowledge.net [7 January 2013].

[2] Dawkins, A. R. 1996. *The God Delusion*. London: Transworld Publishers.

[3] Hutchinson, I. 2012. Monopolizing knowledge:a refutation of scientism. *In: Faraday Institute Summer Course no. 7: Science and Religion the view both ways*. Cambridge.

[4] Mays, J. D. 2009. *Teaching Science so students learn science, a paradigm for Christian Schools*. Texas: Novare Science and Math.

[5] Crawley, W. 2010. *Galileo: what really happened?*, available at `http://www.bbc.co.uk/blogs/ni/2010/06/galileo_what_really_happened.html` [8 January 2013].

[6] Mcgrath, A. 2012. Science, religion and the new atheism. *In: Faraday Institute Summer Course no. 7: Science and Religion the view both ways*. Cambridge.